MALAIKA

10/10/2013

Marine Operations Manual

Manuals (of varying degrees of helpfulness) for the boat's equipment are found in the dark blue concertina folders in the cupboard above the port side saloon. There is also a blue folder of important stuff. Please read them all.

Malaika

MARINE OPERATIONS MANUAL

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VESSEL PARTICULARS

Alan Wright designed Oceans 14 – GRP Quality Blue Water Cruising Sloop

This yacht is a solidly built, comfortable and well equipped cruising yacht, with a teak interior. Built in NZ by Salthouse Bros. and designed by Alan Wright, she is in excellent condition. Sails and rigging are all in good condition and she is fully equipped ready to go sailing. Equipped with all furling sails, and a hard dodger, she can be sailed without having to leave the safety of the cockpit. She is also well equipped with electronics, awnings and many cruising extras. Accommodation consists of a forward cabin with shower, toilet and vanity, Owner's large aft cabin with ensuite shower and toilet, and writing desk, 'U' shaped dining settee and teak table. The starboard side cabin is currently utilized as a workshop/store. This yacht is Malaysian registered and presently located in Langkawi, Malaysia.

Year Launched	1985
Design	Oceans 14
Designer	Alan Wright (NZ)
Builder	Salthouse Bros. (NZ)
Registered	Langkawi, Malaysia
Last Slipped and Antifouled	Jan-13
Keel	Fully encapsulated lead keel with medium-length fin keel.
Length	14.6m (47’11″)
Beam	4.24m (13’11″)
Draft	1.80m (5’11″)
Registered Displacement	12,000kg (26,460lbs)
Last Haul Out Weight	Approximately 20,000kg. At time of haul out full fuel, water, fully provisioned and outfitted for fulltime cruising.
Hull	GRP with coach roof , composite epoxy
Water	2 x 300 ltr = 600 total ltr (158.5 U.S. gal, though the last two times we filled it was close to 700 ltr if you believe the marina water meter)
Fuel	2 x 225 ltr = 450 total ltr (118.8 U.S. gal)
Propeller	3 Blade Fixed prop.
Engine	1 x diesel 110hp (82kW) – Volvo TAMD30 (1986) S/S Shaft drive.
Genset	Fisher-Panda PMS 4500 FCB, 230V, 50Hz, 3.8KW, installed May 2008 – 396 hrs. (as of January 2014)

Engine Hours	3,027 hours (as of October 2013)
Speed	8 knots under power.
Fuel Consumption	Approximately 4 ltrs/hour at 2000 rpm
Accommodation	Accommodation: Forward cabin with shower, toilet and vanity. Owner's aft cabin with ensuite shower, toilet and vanity. Writing desk.
	Starboard side cabin currently used as workshop/store.
	'U' Shaped dining settee and teak table. Separate lounge settee can be a single pilot berth. New upholstery and carpet (2010).
Interior	Teak lined interior. Headroom 1.9m (6′ 3″).
Shower	2 internal dry head showers + deck shower.
Water Maker	PowerSurvivor-80
Toilet	2 Manual
Holding Tank	1 x 50 ltr (11.0 gln).
Galley	2 Burner Stove and Oven with grill. Double s.s. sink. Manual and pressurized water system (added two water expansion bladder tanks 2011). Shore and generator powered 240V electric hot water heater (2011). 12V Danfoss freezer and fridge compressor with automatic variable speed control (2012). Shore and generator powered Marine Air 16,000 BTU marine air conditioning in main salon (2011). Stainless gas BBQ grill mounted on aft teak handrail.
Dinghy	2.9m APUS Aluminum RIB with Hypalon tubes (Dec. 2012). Outboard: 15 hp Yamaha Enduro 2 Stroke (2007)
Engine Start Batteries	750 CCA each, 2 x 90 amp.hrs. at 20AH rate (Dec. 2013)
House Batteries and Inverter	AGM 4 x 90 amp.hrs ; Outback Power Systems FX 2012ET 2kW invertor/charger and remote monitoring/control panel.
Solar panels	2 x 65 watts.
Electronics & Navigation	Raymarine Radar / C80 Chart plotter / GPS; Wind direction – Autohelm ST50; DSM 30 echo sounder, speed and temperature sensor; Interphase forward looking sounder; Autopilot, – Autohelm ST7000; Compass – Sestrel;
Radio Equipment and Desktop Navigation	SSB radio – Icom 700 Pro; VHF – Icom 504 with cockpit mic (2012); AMEC AIS transponder (2011) connected to VHF DSC and serial to USB connection on nav table to display AIS and vessel position on laptop (OpenCPN);
Entertainment	LED TV and 2.1 sound (2011).

Mast/Rigging	Cutter rigged with Aluminum spars (1985) with stainless steel standing rigging (2005). Fully stepped mast. Selden Rodkicker Type 30 rigid boom vang.
Deck Gear	Swim Platform. Boathook. Warps. Fenders. Davits
Windlass	Maxwell Electric VWC 2200 windlass. Rebuilt windlass motor (2012) and anchor chain locker cable replacement (2012).
Anchor and Chain	60lb Manson CQR with 100 meters of 3/8" chain in locker marked at 10m intervals. Spare chain in lazarette. One spare CQR anchor.
Safety Gear	Life raft: RFD 6 man, (last service 2007); Gas detector. Fire extinguishers & fire blanket; Emergency steering; 2 Danbuoys. 2 Life buoys. EPIRB 406MHz; 6 bilge pumps (2 manual / 4 electric).
Sail Inventory	All sails furling. Mainsail on Boomfurl – North Sails (2005). Staysail Genoa (2007). 110% high cut headsail. Storm jib and trysail. Spinnaker with sock, spinnaker pole and reaching strut. Rig: Cutter rigged with Aluminum spars (1984) with stainless steel standing rigging (2005).
Sail Area	Genoa 465 ft^2. Main 457 ft^2.
Covers	Main sail cover. Sun awning. Foredeck and aft deck awning. Cockpit, Bimini, Binnacle, teak rail, lifeboat, BBQ, windlass and winch covers.

About the name:

At one time we think she was the *Alcina II* (named after opera?). But some previous owner renamed her *Malaika*, a Swahili word that means "Angel." It is also the name of a famous African love song. When we considered keeping the name, Jessica insisted that we find out if the word implied a Christian angel or some pagan ghost spirit. That was when we learned that "Malaika" is the feminine rendition of the Hebrew/Arabic name "Malachi" (as in, the prophet in the Bible). They both mean "angel/messenger." "Malaikah" with an "h" on the end is also "angel" in Malay and Indonesian. Our Russian neighbor at One15 says "Malaika" means "woman from Malaysia" in Russian, appropriate since we found the boat in Malaysia. All good meanings, so we felt free to keep the name. We hope that with her sailing history (& name intact), somebody might stop by the boat one day and say "I knew this boat when it belonged to… xxx. Let me tell you some stories about where she has been…."

We are at least the sixth owner of Malaika. Previous owners:

- Owen and Jessica Jenschke (confirmed owner) – 2010 to present day – boat purchased in Langkawi, Malaysia. At first Cook Island flagged and later changed to Malaysian flag.
- Phil and Fay Atkinson (confirmed owner) – 2010 to December 2010 – boat traded in Langkawi, Malaysia. Australian flag # 858634.
- Lex and Joanne (Jo) van Os (confirmed owner) – 2007 to 2010 – Australia, brought Malaika from Australia to Southeast Asia. Logged estimated 1000 hours on the engine. Australian flag.

- Dieter & Anne Losansky (confirmed owner) – 2002 (? based on FCC license granted December 11, 2002) to 2007 (?) – Captain Cook, Hawaii. U.S. official number DL3920X.
- Keith & Helen Beaver (suspected owner) – 1992 (?) to 2002 (?) Paihia Bay of Islands; thought to have been bought through Salthouse brokerage.

The Malaika has been in several known and suspected Locations:

- Southeast Asia including Indonesia, Singapore, Malaysia and Thailand per Lex & Jo's blog as well as Owen and Jessica travels.
- Captain Cook, Big Island, Hawaii – Scarborough Marina (life boat was inspected there in April 2002 and April 2005).
- Auckland to Musket Cove Fiji Rally, 2002. "Ponsonby Cruising Club" (confirmed with plaque on vessel).
- Brisbane, Australia to Darwin, Australia, 7 weeks in June/July 2007 (per Lex's notes).
- Originally built and launched in New Zealand.

What we <u>think</u> we know of the Malaika's history:

- Hull by Goodwin; Fitout & rigging by Salthouse NZ. Launched 1985 as "*Alcina II*". We really wish we knew what was the "Alcina I"?!!!
- 60hp engine upgraded to current 110hp Volvo TAMD30/MS3C engine in 1986/7.
- Refitted at Salthouse by Ken & Helen Beaver, 1992?

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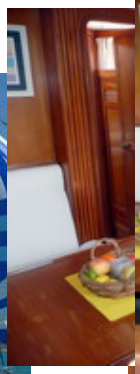
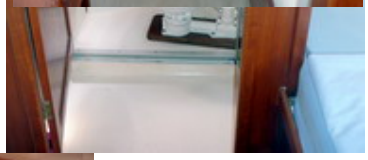




MAIN ENGINE

The main engine is an inline four cylinder turbo charged diesel 110hp (82kW), model Volvo TAMD30. It is believed the original 1985 diesel engine was replaced with the TAMD30 in 1987(6?), about one year after vessel delivery. A stainless drive shaft is connected to the engine through a flexible coupling and a three blade fixed prop is connected to the shaft end.

Checks before starting engine:

- Before starting the main engine, check to see if the main salt water engine cooling seacock is open. This is located at the foot of the companionway steps in a trap below the fire extinguisher.
- Check the engine oil level. Access is through the cupboard in the passageway between the galley and the aft cabin. The dip stick is located on the port side and slightly forward of the starboard access door.
- Check the cooling water level.

Starting engine:

- Make sure the gearbox is in neutral with the clutch disengaged. To do this, pull out the black knob in the center of the speed control lever on the starboard side of the helm. This can only be done when the speed controller is in the North/South position.
- Push the speed control lever forward about 30 degrees. You are now ready to fire up the engine.
- Turn the switch in the cockpit clockwise slowly until a buzzer sounds. Hold the switch in that position for approximately 20 to 25 seconds this operates the glow plug for the engine.
- Turn the switch off anticlockwise wait for 5 seconds and then turn the switch quickly all the way to the right clockwise until the engine fires. If the starter motor does not engage and there is a rasping sound, turn off anticlockwise and then try again. Once it has fired up set the engine revs at approximately 1000rpm until it has warmed up.
- Run at idle to warm up.
- Check over stern to ensure water is flowing out of exhaust outlet under stern. For the first few times so you can see what properly flowing saltwater looks and sounds like put your hand over outlet and feel hot water coming out. If no water, turn off engine and diagnose and fix. (Do not recommend cracking the salt water strainer screw on lid to get air out of the salt water system as the salt water drops down into the alternator – unless you take precautions and do it very carefully)!
- If all is OK and gauges are reading correctly, you can proceed to motor away.

To turn the engine off simply turn the ON/OFF switch in the cockpit anticlockwise until it stops.

Notes:

- Read and rely on the Volvo engine manual!
- Most economical motoring revs is 1800-2100 rpm (about 4 liters/hour).

- Main revs are 3800 but please do not exceed 3200 rpm as this is the max due to large propeller size.
- If you exceed 3200 rpm when the engine is NOT in gear you may permanently damage the engine.
- At approximately 2500 rpm the turbo kicks in.
- With turbo powered engines immediate shut down of engine can cause damage to turbo unit. Allow for idle speed cool down of engine after extended running.
- If temperature alarm sounds turn off engine. The alarm starts barely audibly and increases to a loud sound – gives you time to register what's happening.
- Never start the main engine without checking the salt water intake seacock is ON. Clear barnacles etc. out of the inlet pipe regularly.
- Clean the salt water intake filter regularly. There are plenty of spare filters and a quantity of stainless steel mesh for replacement should that become necessary.
- Change oil, filters, air filter and gearbox oil every 250 hours. There is a manual sump pump in the workroom. Run the engine to heat up the oil and make it easier to pump.
- The oil cooler was replaced in March 2008.
- The stainless steel wet exhaust on the outlet side of the turbo was replaced in February 2009.
- The propeller shaft was replaced with a new one in November 2008.
- Load the engine room stuffing box grease reservoir with grease and turn the knob a quarter of a turn or so daily when motoring to lubricate the prop shaft daily. Expect it to leak a few drops of saltwater.
- Switch to blow hot air out of engine room space located below throttle.
- When under sail only lock prop by engaging reverse gear.

Component	Quantity	Manufacturer	Model	Description
Main Engine	1	Volvo		
House Alternator / Water Pump Belt	2	Gates	7430 Gates XL	11A1090
Engine Room Blower	1	Rule	Model 240	4" in line 12Vdc blower

FUEL SYSTEM

There are two independent fuel tanks, one 225 liter tank located port under the passageway counter and one 225 liter tank starboard under the workshop bench. Each fuel tank has an independent fill and vent lines. Each tank has two fuel delivery lines that run into the starboard engine room compartment where each fuel tank has dedicated master isolation valves supplying common fuel headers. The

common fuel headers are run into a fuel filter and the subsequent filtered fuel is distributed to the main engine and the auxiliary generator electric fuel pump (located port side in main engine room compartment).

If for any reason it is necessary to turn the fuel off there is master fuel delivery and fuel return isolation valves located in the starboard engine room space. Access is through the workshop underneath the bunk. The fuel isolation valves are identified by two sets of knurled taps located in the starboard engine room space (two small silver cocks for each tank -two starboard for starboard tank, two port for port tank). The fuel taps and downstream fuel filter supplies both the main engine and the auxiliary generator.

Each fuel tank is also fitted with a sump and drain valve. Water condensate and particles in the fuel tank will settle in the sump. Periodically drain the fuel tank into a jar or small container to remove condensate and particulates.

Fuel Considerations:

- Never put diesel fuel in tanks unless you are satisfied it is clean good diesel. A galvanized combination funnel/strainer is stored in the starboard workshop for diesel fuel filling only. Fuel rate is slow but check regularly for water.
- Keep the fuel filters clean.
- Consult other yachties about the standard of fuel in the area in which you are cruising. The horror stories you hear occur mostly in third world countries.
- Out of the service station bowser or from a marine fuel agent in third world countries is usually safe. The fuel and water boat in Ao Chalong, Phuket, Thailand is reliable. Fuel bought in service stations in Indonesia and Malaysia was always clean.
- Fuel supplied in open jugs, buckets, etc. is usually to be totally avoided.
- Diesel cut with turps is not uncommon from unscrupulous dealers/vendors. Therefore always TEST FIRST by putting say half a liter of diesel in a clear bottle and add a couple of drops of methylated spirits. The metho dissolves, crap goes to the bottom and the diesel sits on top. IF THERE IS CRAP DON'T BUY THE FUEL – GO ELSEWHERE.

AUTOPILOT

Power is by turning ON the NAV switch on the right hand side of the main switch panel which engages the whole Autohelm autopilot/sailing instruments system. The AP is then operated from the panel in the centre of the pedestal behind the wheel or at the nav table.

After turning on the NAV switch a beep will sound indicating a satellite fix is wanted and will continue until you turn on the Raymarine C80 chart plotter.

Notes:

- If the Autopilot and instruments fail to power up – check connections behind the NAV table and/or cockpit display – sometimes work loose. OK since taped up. Note: fully serviced and recalibrated and a new masthead unit was installed October 2009.
- NOTE!!! Turn the autopilot to standby and manually steer when transmitting on the HF Radio (or the boat may do a 180). (Further note: this was never experienced by Owen and Jessica though we never used the SSB).

DEPTH FINDER AND FORWARD SCANNING SONAR

The Raymarine depth finder shows seabed distance from bottom of keel. When the Raymarine sensor shows 0.0m the keel is right at the mud line. The Interphase Sea Scout forward looking sonar shows distance from seabed to Sea Scout sensor. There is no offset configuration on the Scout.

ANCHOR

ALWAYS run the main engine when operating the anchor winch electric motor.

Before operation the anchor immobilizer switch has to be switched ON. (North/South is ON and East/West is OFF) the switch is left of the fire extinguisher at the base of the companionway steps.

Once switched on the anchor may be raised either from the cockpit or preferably from the foot switches on the foredeck. When pulling in a long length of chain, say more than 10 meters (the chain is marked with white paint every 10 meters), it is wise to clear the chain from underneath the windlass as it can back up and if not cleared periodically it can temporarily jam the windlass.

When lowering the anchor do so by free fall not by motor. First release the clutch at the top of the Maxwell windlass using the grey alloy handle provided that is kept in the rope locker in the cockpit (anticlockwise to release). When the correct amount of chain is deployed check the flow of chain by using the clutch (turn clockwise). Once satisfied all is well fix the snubber located in the rope locker to the chain over the bow and affix to the main bollard and ease the chain to stop unnecessary noise inside the boat and stress on the Maxwell anchor winch.

Having completed the anchoring process, remember to switch off at the anchor isolator circuit breaker.

Notes:

- The Maxwell 2200 winch is a good winch for the boat.
- The anchor raise/lower push buttons on the helm do operate. The power ON/OFF push button on the Maxwell anchor winch binnacle controller is disconnected. This was reportedly done after a circuit board (since removed) in the waterproof control box failed and the winch was wired to operate without it via the foot switches on deck and the up and down toggles at the helm.
- There is also a 185 amp circuit breaker designed to trip on overload. This circuit breaker is located in the starboard side engine room, forward bulkhead and it must be reset if it trips. Access is through the workshop bunk cover.
- A spare CQR is located in the aft bunk along with 20m of chain and 150 warp.

POTABLE WATER SYSTEM

There are two independent potable water tanks, each tank holds 300 liters and each one is molded into the centerline of the hull. Each tank has an independent fill line but share a common vent line. The two tanks potable water delivery lines have independent isolation valves located under the floor near the galley sink. The two delivery lines then are joined into a common header which is run to the potable water pressure pump located in the engine compartment. The common header also supplies potable water to the manual foot pump under the galley sink.

The potable water pressure pump supplies cold water to the galley sink, forward head sink and shower and the aft head sink and shower. In addition, the water is supplied to a 1500W electric water heater tank located in the engine compartment. Both the cold water and the hot water system are outfitted with a pressure accumulator bottle (CIMM model xxxx) to deliver constant water pressure in between potable water pump cycles.

Component	Quantity	Manufacturer	Model	Description
Potable Water Pressure Pump	1	Shurflo	5900-0211 v 13.6 DC	Shurflo Smart Sensor 5.7, fuse size 15, max amps 10, open flow 5.7, pressure setting 65, manuf 10/09, thermally protected Type IV, ignigtion protected
Pressure Accumulator Bottles	2	CIMM		
Manual foot pump	1	Whale	Gusher Galley Mk. 2 Pump	
Water Heater	1	Rheem	65 Series	220V, 1500W, Electric Hot Water Heater
Water Heater Relief Valve	1	Watts	No. 100XL	Automatic Reseating Combination Type Temperature and Pressure Relief Valve, 3/4" male inlet and 3/4" female outlet.

WATER MAKER

Owner's Manual is in the blue concertina folders.

To Clean Membrane:

- 3 way intake valve is alternate intake position. The valve is up under bookshelf beside the blue intake filter case. Point it at the pump.
- Remove the brine line from its connection at the pump and put on the temporary reject line (because it's easier than finding the opposite end of the brine line).
- Take the cleaning fluid/biocide pick up line and put into the bucket of solution.
- Place the end of the brine line into a container. This is to catch the reject water for 30 seconds or so. Then place into the bucket so it can circulate the alkaline mix. In through the intake – out via the brine line.
- Unit in PRIME/CLEAN position
- Switch unit ON and run for 15 minutes
- Turn OFF and let set for 1 hour.
- Restart, dump first few pulses from brine line, then place back in bucket. Recirculate for 30 to 60 minutes.
- To flush with fresh warm water reconnect proper brine line to the pump, place the intake line into bucket of fresh warm non chlorinated water. Turn ON with unit in PRIME/CLEAN position.

To Unpickle:

- Turn seawater valve on
- Unit in "PRIME/CLEAN" position
- Put new filter into blue filter case
- Manually switch salinity monitor to "REJECT". The salinity monitor is underneath port side window near galley.
- Make sure 3 way tap is turned to saltwater intake.
- Turn red power switch on
- When water is running evenly (pulses) out of reject tap, then turn prime/clean to RUN.
- Run for 30 minutes, then switch salinity monitor to AUTO.
- If it's all working then no water will come out of reject tap.

Spare parts supplier in Australia is Seven Seas Marine 07 5502 9066. Service and parts available in Phuket, Thailand through Bradley E. Kenny, ESP (Environmental Solutions & Protection Corporation, Ltd, esppkt@ksc.th.com, 081-633-4279.

Component	Quantity	Manufacturer	Model	Description

Water Maker	1	Katadyn	PowerSurvivor-80, Model MROD-80-LM-1 (Enclosed), serial number LM10189.	October 1995 by Aqualarm in Aukland, New Zealand.
Salinity Meter	1			

WATER TREATMENT

Use the following chart in for adding household bleach (5% sodium hypochlorite) to tank water. This will remove remaining viruses and inhibit bacteria and algae growth. It is best to add bleach when filling tank from shore supply or when using water maker. Beware that many countries are now stocking "ultra-bleach" usually 7.0% to 7.5% sodium hypochlorite. Iodine is not recommended because of health risks associated with the frequent and long-term use of iodine.

CONVERSIONS

1 ounce = 30cc
1 tablespoon = 15cc
1cc = 20gtts (drops)
3.84 liter = 1 gallon
1 teaspoon = 5cc
1 liter = 0.2604 gallon

To use the chart, calculate the total number of liters you wish to treat. Then, read across to the amount in ml's of bleach you need to add to your tank.

Liters of Water	ml or cc of bleach	Drops of bleach
1	0.1	2
2	0.2	4
3	0.3	6
4	0.4	8
5	0.5	10
6	0.6	13
7	0.7	15
8	0.8	17
9	0.9	19
10	1.0	21
20	2.1	42
30	3.1	63
40	4.2	83
50	5.2	104
60	6.3	125
70	7.3	146
80	8.3	167
90	9.4	188

100	10.4	208
200	20.8	417
300	31.3	625
400	41.7	833
600	62.5	1250

Water should be allowed to stand for 30 minutes after application of bleach, prior to drinking. Add double the amount of bleach for cloudy or colored water. After treatment, water should have a slight chlorine odor. If not, repeat the dosage and allow treated water to stand for an additional 15 minutes. Maintain the recommended level of chlorine (3-5ppm) by checking the chlorine levels every two weeks, using a simple swimming pool test kit.

Notes:

- Disinfect raw fruits and vegetables by soaking them for 15 minutes in a 10% bleach solution. Add 5 drops of household bleach for every quart of water.
- Only water that has been adequately disinfected (boiled, filtered and/or chemically treated) will protect you from viral and bacterial waterborne diseases. If boiled at sea level, water should be brought to a rolling boil for at least one minute and cooled.
- When in a marina or near shore where sewage accumulates, do not use seawater to wash your dishes. Instead, use bleach and water rinse solution or rinse your dishes with boiling water.
- It is a good idea to sanitize your water tanks at least twice a year by mixing 1-teaspoon of liquid dish washing detergent and 1/8 cup of household bleach. After the solution is dissolved, pour it into empty water tank(s). Fill water system with about 10 gallons of water and open each tap on board, including those in showers, until solution appears at the faucets. Let the solution remain in the tank and lines for at least an hour to ensure good disinfecting. Open all taps and allow the solution to completely run out. Follow this by at least two full rinses of the tank. This, of course, is done when you have plentiful potable water supplies (*Practical Sailor*, December 1998, p.5).

SALT WATER SERVICE

A common salt water intake supplies the wash down pump, aft head, generator and water maker. The generator has its own strainer and the wash down pump, aft head and water maker share a strainer. Both strainers are located in the engine room.

The wash down pump has outlets at the galley sink, aft swim platform and in the chain locker. The chain locker outlet is fitted with a hose and spray head for use when retrieving anchor.

It is possible to back flush water maker supply line, salt water wash down pump and aft toilet with fresh water. A hose for this back flush is located in the water maker compartment behind the port settee.

Refer to salt water process diagram for more details of the salt water service arrangement.

Component	Quantity	Manufacturer	Model	Description

Wash Down Pump	1	Jabsco	PAR-MAX3	3.4 GPM Automatic Water Pressure Pump
Salt Water Service Strainer	1	Jabsco	Pumpgard 46200-0000	¾" inlet and outlet hose connections
Strainer Service Kit	1	Jabsco	18753-0020	Coarse Strainer – 20 mesh stainless steel filter screen

GRAY WATER

All gray water from the aft head sink and shower is gravity flow into the main engine bilge. The forward head sink and shower water flows into a sump in the v-berth floor. From there a bilge switch and pump automatically pumps it into the main engine bilge. The galley sink water flows directly overboard and has never clogged.

BLACK WATER

There are two Jabsco toilets onboard. The forward head is the simplest and only has direct overboard discharge. The aft head discharge goes through Y-Valves to allow either direct overboard discharge or into a holding tank. The holding tank is vented through a filter and overboard vent in the starboard aft transom.

A macerator pump is used to pump the holding tank contents directly overboard.

Notes:

- Rebuild kits are readily available as this is a very common toilet.
- The aft head hoses, Y-Valves, anti-siphon loop and the aft head overboard discharge valve was replaced in January, 2013.

Component	Quantity	Manufacturer	Model	Description
Toilet	2	Jabsco	29090-3000	Twist 'n' lock manual toilet, compact bowl
Y-Valves	2	The Bosworth Company	Item ID: BM95 Order #: Y-21001	Sea-lect Y-Valve, base mount, 1-1/2" hose barbs. New in 2013.
Anti-siphon Loop	1	Jabsco		New in 2013
Macerator	1	Jabsco		

BILGE SYSTEM

There are four 12Vdc electric bilge pumps and two manual bilge pumps on the vessel.

- Main (engine) bilge pump – automatic electric operation
- Forward grey water sump bilge pump – automatic electric operation
- Navigation bilge pump – manual switch operated electric
- Sink (galley) bilge pump – manual switch operated electric
- Cockpit bilge pump – manual diaphragm pump to pump out engine bilge
- Starboard settee bilge pump – manual diaphragm pump to pump out keel compartment.

The four electric bilge pumps are turned ON/OFF at the DC distribution panel. In normal operation, the MAIN engine compartment and FWD grey water sump bilge is in the ON switch position. The NAV and SINK bilge pumps are left in the OFF position.

Notes:

- Keep the MAIN engine bilge discharge outlet clear. Barnacles like to grow in the discharge. If the discharge is partially or fully blocked water will be forced out of the orifice located behind the workshop mirror. You will first notice water on the workshop floor.
- The lazarette also drains into the main engine bilge. There is a lazarette bilge isolation valve located under the aft master bed.

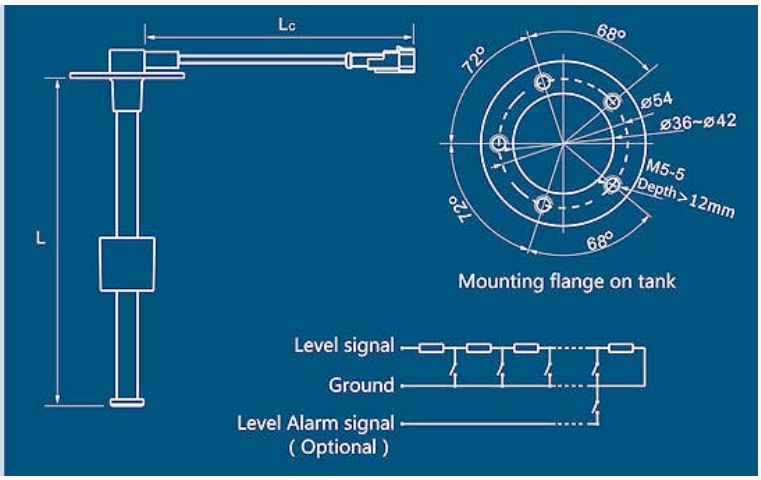
Component	Quantity	Manufacturer	Model	Description
Main (Engine) Bilge Pump	1	Rule		12Vdc
Forward Grey Water Sump Bilge Pump	1			12Vdc
Main and Forward gray water Bilge Switch	2	Rule	35A	12Vdc automatic cut on and off.
Navigation Bilge Pump	1			12Vdc
Navigation Bilge Switch	1			
Sink (Galley) Bilge Pump	1			12Vdc
Manual Bilge	2			

Pump				

TANK LEVEL MEASUREMENT

The two diesel fuel tanks have a VDO level gauge measurement system. The stainless fuel tanks are approximately 15-3/4" to 16" deep and use a 10-180 ohm VDO sender and VDO gauge. There is a "Port/Stbd" selection switch near the navigation station to select which tank to monitor on the guage. There is also an off position which reduces the electrical power consumption.

Only the aft potable water tank has a level measurement sender. Normally both the aft and the forward potable water tanks are connected together and indication of level in the aft tank suffices for level in the forward tank. It is possible to add a sender to the forward tank but note there is a sloping wall preventing a clear straight passage to the bottom of the tank. The aft tank has no such obstruction and is clear passage from top to bottom of tank.



Component	Quantity	Manufacturer	Model	Description
Fuel Tank Sender	2	VDO		VDO fuel level sender, 10 to 180 ohms, universal 6" to 24" adjustable.
Fuel Tank Gauge	1	VDO		
Water Tank Sender	1	Wema	Liquid Level Sensors - SSS/SSL Diesel, Fuel or Water Level Sensor	**Material:** SUS 316 Stainless Steel **Length:** 30" (Available 19" through 60" at 1" increments) **Mounting Methods:** Standard SAE 5 hole pattern **Protection Rank:** IP67 **Output Signal:** Standard American 240-33 ohms. **Resolution Range:** 10-40mm **Operational** -40°F ~ +185°F (-

				Temperature: 40°C ~ +85°C)
Water Tank Gauge	1	Wema	UPWR-BB-240-33	**Model:** UPWR-BB-240-33 **Part #:** 110315 **Signal:** 240-33 Ω[1] **Working V:** 12V/24V **Range:** Empty to Full **Mtg Hole:** 2-1/16" (52mm) **Face:** Black **Bezel:** Black Plastic

HYDRAULICS

There is only one simple hydraulic system onboard. This is for the helm and rudder control. The fill port is incorporated into the top of the helm. There is a bypass valve in the lazarette which allows the rudder to move freely. The bypass valve is also used to bleed air from the helm pump and lines to bypass valve.

To bleed system or disengage hydraulics to the rudder for servicing – Open bypass valve located just inside center lazarette hatch, port side. Turn wheel say ten turns in one direction. Oil will be drawn up vent line into helm pump. Then turn wheel in opposite direction. Close bypass valve and cycle from lock-to-lock. Wheel should come up hard and full over and equal turns both ways.

If air is still present reopen bypass valve and turn wheel more. This pumps oil through the lines and allows air to get back to the helm pump's internal reservoir and then to atmosphere. Close bypass and check.

Component	Quantity	Manufacturer	Model	Description
Helm Pump	1	Teleflex Canada	Capilano 1275V	Part number HH5275. Seal kit HS5161. Outlet check kit 1250/1275 number HP0964. Front cover 058124.
Cylinders	2	Teleflex Canada	BA 175-7TM (need to verify)	Part number HC5350 (need to verify). If correct cylinder thought to be 7" to 9" stroke with 13.7 cu. In. cylinder volume.

LP GAS

There are two gas bottles stored in a containment area within the lazarette. The LP storage container is vented starboard overboard. There is a single regulator and gas line from one bottle to the gimbaled galley stove/oven. The second bottle is used as a backup second bottle and is outfitted with a separate regulator and hose for periodic temporary connection to the aft BBQ.

Remember to turn the gas off when not required especially overnight or if the boat is to be left unattended.

GALLEY STOVE AND OVEN

Starting instructions and parts list for the galley stove and oven are in the blue concertina folders.

Component	Quantity	Manufacturer	Model	Description
Galley Stove and Oven	1	Mariner	Mariner Princess	Stainless two burner range with oven and infrared grill.

ELECTRICAL SYSTEM

The *Malaika* is outfitted with two battery banks and four sources of power.

Battery banks:

- House bank is 4 x 90 amp/hr AGM sealed batteries for a total of 540 amp hours.
- Engine starting bank is 2 x 750 Cold Cranking Amps (CCA) sealed maintenance free batteries. Reserve capacity of 2 x 90 amp/hr for a total of 180 amp hours.

Sources of power:

- Main engine is outfitted with two independent alternators, one for each battery bank.
- 240Vac single cylinder diesel generator in the lazarette.
- 2 each 75W Solar panels.
- 220-240V shore power and 2kW inverter/charger.

Master Switch

Switch in starboard workshop is normally in position 1. This connects the engine crank batteries to the main engine starter, port side alternator, auxiliary diesel generator controls, anchor winch, boom furler and battery monitor.

Switch located at the corridor end of seat in the saloon next to mast support is normally in position 2. This connects the house batteries to the inverter/charger and all other 12V house distribution.

Battery Charging

Main Engine Alternators

Main engine is outfitted with two independent alternators. The starboard alternator can charge the house battery bank and the port alternator can charge the engine start batteries. The alternators are each rated for 85 amps but rarely show more than 50 amps. A "Mastervolt Alpha Pro" alternator regulator is located in the engine room and controls the house battery bank charging voltage. The Mastervolt regulator is on the starboard engine room side above the Jabsco macerator. It is properly adjusted.

Auxiliary Generator

A 3.8kW, 240Vac, 50Hz Fischer Panda auxiliary generator is located in the lazarette. A control panel is located near the navigation station to start/stop the generator and provides alarm indication. Warm up the generator for a few minutes before applying load and cool down generator for 5 minutes at no load before shut down.

Inverter/Charger

Maliaka is equipped with an Outback Power Systems VFX Inverter/Charger which is located under port saloon settee aft end at centerline. Inverter control panel (black with two upper level and four lower level grey buttons) is on outboard side of nav station.

The inverter can supply 240Vac power from the 12Vdc battery banks (great for charging computers, etc.). However this will consume large amounts of amp/hours from the batteries. If you need to use 240Vac for extended periods of time use the genset.

The charger will charge batteries when a 240V shore power supply is connected or the 240V generator in the lazarette is in operation. Both battery banks will be charged if both battery switches are switched to BOTH.

Solar Panel

There are two each 65W Solar panels mounted on the aft dinghy davits. The panels are always connected and will always trickle charge batteries when exposed to sun. A solar panel charge controller is mounted in the starboard engine room compartment to regulate the voltage and monitor solar panel output. The charge controller has a reset button on the bottom and behind an access door there are DIP switches and push buttons for programming the controller.

Default Mode Switch Settings	OFF	ON
Switch #1		
Switch #2		
Switch #3		

Shore Power

A plug is mounted on the starboard side of the cockpit forward bulkhead. Preferred shore power is 220-240V though most equipment will operate normally above and below this level.

There are 240V general purpose outlets in the workshop, at the nav panel, to the left of the galley sink, in the starboard aft cabinet above the starboard settee and in the forward cabin. There is no 240V general power outlet in the aft cabin.

Battery Monitor

A AMP-HOUR+2 meter monitors the amp-hour charge and discharge of both battery banks. The engine starting batteries are wired to "BATTERY #1" and the house batteries are "BATTERY #2". The LOW battery LCD indication will start flashing when either the engine and/or house batteries are discharged to the 50% capacity level.

There are six DIP switch settings inside the AMP-HOURS+2 module.There are also software configuratble settings that mus be reset if the module is disconnected from battery power (upon disconnect of module power all software settings are reset to factory default). The module parameters

will have to be reconfigured to match the onboard battery characteristics if the module power supply is disconnected. A full description of how to program the software configuration is contained within the onboard hard copy installation manual.

Default Mode Switch Settings	OFF	ON
Switch #1	Disable Full Bat. Out	Enable Full Bat. Out
Switch #2	Disable Low Bat. Out	Enable Low Bat. Out
Switch #3	Normal Temp.	Warm Temp.
Switch #4	Liquid Batteries	Gelled Batteries
Switch #5	Two Batteries	Battery / Source
Switch #6	Amp-Hours Consumed	% Charged

The Default Setup Values from the FactorFy Are:	Factory Default Values	Actual Required Values
Battery Capacity	200 Ahrs	#1 Engine Battery – 2x90 = 180 Ahrs. #2 House Battery – 2x90 = 360Ahrs
Charged Voltage	13.2 Vdc	13.2Vdc
Charged Current	2% of battery capacity	2% of battery capacity
CEF (Charged Efficiency Factor)	87% for Liquid Acid 90% for Gelled Acid	87%

Helpful Hints on Using 240V Appliances

Best use the generator for 240V operations of power tools, kitchen appliances, microwave, etc. and subject to demand requirements these operations at sea should be timed to occur when the genset is in use charging battery banks.

The BLUE motor

A 240V, 50/60Hz motor is mounted in the engine compartment. This motor used to drive a refrigeration compressor which has been removed. The BLUE motor may be repurposed to drive other machinery such as a future mechanical water maker, air compressor, etc. It is possible to run the motor from onboard generator power or shore power.

Note: Do not start the motor under load when the main engine has been run for an extended period of time and the engine compartment is hot; this may result in failure of the BLUE motor start capacitor (POP!). If this happens, remove the blue cover and replace the gray capacitor (run) and/or start capacitor. Check the wiring in the blue box is all secure also. There are spare capacitors onboard.

Component	Quantity	Manufacturer	Model	Description
Inverter	1	Outback	FX2012ET	2.0 kW / 12Vdc / 230 Vac / 50 Hz. Maximum continuous output power 2000 VA. 35 amps peak (for 160mS current limit). Inverter will shut down after 5 seconds of operation in current limit.
Generator	1	Fischer Panda		3.8kW, 240Vac, 50Hz
Main Engine Alternators	2	Bosch	BXU1285	Bosch heavy duty alternator. 12 volt 85 amp. Bosch 0 120 484 038.
Engine alternator regulator.	1	Bosch	Bosch 9 190 067 019, EP 14V4	Mounted to rear of alternator. Self-Excited.
House Bank Alternator Voltage Regulator	1	Mastervolt	Alpha Pro	(engine cranking battery bank uses Bosch built in regulator).
Engine alternator V-belt	1		10mm x 950mm	Can use a slightly longer belt
House alternator V-belt	2		10mm x 1100mm	Can use a slightly shorter belt
House Batteries	4	Fullriver	HGL90-12	AGM, 90Ah each at 20A discharge rate
Engine Batteries	2	3K	VS150 Size 105D31R	Sealed Maintenance Free 750 Cold Cranking Amps each. 90Ah each at 20A discharge rate. 155 minutes reserve capacity (battery will deliver 25 amps at 80 degree for 155 minutes). New in December 2013, 24 month warranty

Solar Panel	2	BP Solar	BP365U	New in July 2004
Solar Panel Charge Controller	1	Manson	Electro SBC-7120	3 Stage 20 A ,12V PWM programmable charge controller
The BLUE motor	1			
Run Capacitor	1			For the BLUE motor
Start Capacitor	1			For the BLUE motor
Amp Hour Meter	1	Cruising Equipment Co.	AH+2 12V s/n 910 (AMP-HOUR+2)	12V battery monitor, amp hour meter

REFRIGERATOR / FREEZER

The freezer and refrigerator have separate variable speed compressors, independent evaporators installed inside insulated compartments and independent temperature monitors and controllers. The freezer and refrigerator condensers are both cooled with a single potable water circulating pump. The circulating pump is automatically started and stopped with the cycling of either compressor.

The circuit breakers for the fridge and freezer are located under the port forward sette seat cushions adjacent to the house batteries.

Notes:

- Try and keep food and objects away from temperature sensor in freezer or fridge. If the sensor is covered the compressor may run for extended periods of time. This will not damage anything but will unnecessarily consume battery power if under sail.
- A Frigoboat 12Vdc system was installed in 2012/2013.
- The freezer temperature set point is currently 21⁰F. Compressor will turn on at 2⁰F above set point (ON at 23⁰F and OFF at 21⁰F). As the temperature sensor is located near the middle of the top loading freezer, it is much colder at the bottom and even ice may be made using ice cube trays set near the top entry door.
- The refrigerator temperature set point is currently 39⁰F. Compressor will turn on at 2⁰F above set point (ON at 41⁰F and OFF at 39⁰F).
- A defrost cycle is configured to operate three times per day. A "-d-" will show on the thermostat display during defrost cycle. As there are no defrost heaters installed this just allows the evaporator to warm up for a short period of time. This does seem to reduce the rate of frost buildup on the evaporator.

Component	Quantity	Manufacturer	Model	Description
Compressor	2	Veco - Frigoboat		
Speed Controller	2	Coastal Climate Control		Merlin Smart Speed Controller
Evaporator freezer	1	Veco - Frigoboat	Mod. 160F	
Evaporator refrigerator	1	Veco - Frigoboat	Mod. 130F	
Temperature Controller	2	Coastal Climate Control	Coastal MKII Digital Thermostat / Thermometer	
Pump Interface for BD50F	1	Veco - Frigoboat	Interfaccia Pompa x BD 35F-50F	Serial 531442. 261. 11G0506. COD. E51385
Potable water circulating pump	1	Flojet	"Quad II Diaphram" 4105 Series Circulation / Feeder Pump	

NAVIGATION LIGHTS

Component	Quantity	Manufacturer	Model	Description
Tricolor Masthead Light	1	Aqua Signal	Series 40	Tricolor top light and clear anchor light below
Steaming / Foredeck Light	1	Aqua Signal	Series 25	Clear Lens
Stern Light	1	Aqua Signal	Series 41	Clear Lens

MARINE AIR CONDITIONER

Component	Quantity	Manufacturer	Model	Description
Air Conditioner	1	Marine Air	VCP16KZLH-407	16000 BTU Vector Compact Boat Air Conditioner 230V. Supplied by Great Lakes Skipper in Racine, Wisconsin, U.S.A.
Temperature Controller	1	Marine Air	ECU-PSPRT-B 222000100	Passport II Display / Keypad BK for VCP Units. Supplied by Wright Marine Air Conditioning in Florida
Salt Water Cooling Pump	1	March		230V, 50/60 Hz magnetic drive pump
Salt Water Strainer	1			Stainless Strainer supplied by Aqua International in Singapore +65 6299 1944, sales@AQUA.sg

BRIEF DESCRIPTION OF MAIN SAIL RAISING AND LOWERING

Malaika is fitted with an in boom electric furling system originally manufactured by Chatfield Engineering, Porana Road, Glenfield, New Zealand, http://www.chatfieldmarine.com/, +64 9 444 9031.

The electric boom furler is a very useful feature but involves certain know how to achieve best results.

1. Use plenty of silicone spray on the front edge of the sail (black track leader) to help the sail go up and down.
2. The power to the system is 12V and it draws a lot of current. All operations should be with the main engine or genset on to provide the grunt required. When the boat is stationary, and into the wind at zero wind angle, you can furl the main with only 12V but make sure house batteries are at position 2 and engine batteries are at position 1.
3. Take the halyard from the outer end of the boom where it is stored and attach to the headboard of the mainsail and slide the bolt rope of the sail into the mast track.
4. Take up the slack in the halyard (the green rope) which leads from the starboard side of the mast back to an electric winch on the starboard side of the cockpit.
5. When ready to hoist sail, first turn on main engine, then turn the Boomfurl switch in front of the helm on the binnacle to the HOIST position.
6. Before hoisting make sure that the boat is head to wind and then press the foot operated switch at the base of the binnacle on the starboard side. The sail will then start to rise. Every 10 feet or so turn the helm switch to TENSION and press foot switch again until reasonable tension is evident on the luff then turn switch back to hoist and continue up.
7. If the sail jams for any reason immediately stop activating the switch and investigate why. Enormous force is exerted by the winch and damage could result if not checked. If it is not running easily then something is wrong.
8. There is an overload circuit breaker for the Boomfurl located next to the trunking next shore power circuit breaker on the companionway wall. The circuit breaker may have to be reset after a suitable period to allow the circuit breaker and motor to cool.
9. When lowering the sail first start the main engine. Then make sure that the boat is again head to wind. For this procedure the main halyard must be taken off the electric winch and the jammer holding the halyard must be released, whilst at the same time keeping pressure manually on the halyard. Then turn the Boomfurl switch to the REEF position. Once the boat is head to wind the sail will come down smoothly. Reasonable pressure must be maintained on the halyard to ensure a tight furl round the boom. However if the pressure is too tight it can throw the overload circuit breaker "so firm but not crazy firm". In practice the sail stows itself much better if it comes down in one long run rather than stopping and starting on the way.
10. The procedure for reefing is much the same as step 7. But when the sail is reefed to the correct point, (incidentally it operates better if a reefing point is chosen to coincide with the batten being just on top of the boom), tension slightly as with the initial raising procedure.

THE BOOM FURLER SYSTEM

While we consider this system to be the most advanced available, it still does require some knowledge and practice to gain the most efficient operation through its range of functions.

The main switch has five different settings these being OFF, TENSION, HOIST, EASE and REEF or FURL.

- OFF
- TENSION – Operates deck motor only
- HOIST – Operates both deck motor and mast motor in unison
- EASE – Operates mast motor only in a clockwise direction.
- REEF – Operates mast motor only in an anticlockwise direction.

The motors are not activated until the foot switch is depressed, however it is desirable to turn the main switch to OFF after the required setting is achieved to avoid accidental depress ion of the foot switch which would probably require readjustment of that setting.

Before hoisting the main, check to make sure the bolt rope in the sail is at least a few centimeters into the sail track. After tailing the halyard on the deck winch in the appropriate manner, turn the switch to HOIST, turn the boat head to wind and ease the main sheet out of the cleat. When the foot switch is positioned to starboard (as is the case here) it is convenient to have the boom over the port corner of the tuck, which makes it easier to see what is happening as the sail goes up. It is important to make sure there is no weight at all on the main sheet as the sail is hoisted as this will put undue load on the deck winch motor which may not then cope with the speed the drum motor on the mast is unfurling the sail. This will be indicated by slackness in the bolt rope between the furling drum and the feeder, and only requires a quick switch to tension and back to take up the slackness. This can be achieved with the foot switch continually depressed. Alternatively should the bolt rope be under a lot of load before the sail is hoisted, which could occur if the main halyard had not been freed sufficiently the last time the sail had been pulled down this will be indicated by the winch immediately coming under a lot of load and would require a flick to ease and back to rectify the problem. Under normal circumstances none of these adjustments will be necessary.

In the hoisting mode the sail can be taken to full hoist or stopped at a reef point on the way up. While it is not essential the sail when reefed will be at its optimum efficiency if the batten is positioned between six o'clock and nine o'clock on the drum. But by using the indicator marks on the sail and mast watching the position of the battens is unnecessary.

Sail tension if required can be achieved by turning to TENSION or REEF and just touching the foot button. When going to full hoist in most cases the drum will come under load and stop at the correct position with the correct tension but can be adjusted clockwise by going to EASE or anti-clockwise by going to REEF and just touching the button.

To come down there can be *two* slightly different circumstances, these being if you wish to reef or if you wish to furl the sail completely. If you wish to reef to one, two or three position the boom can be out on either side up to 30^0 from dead center, but once again be sure to push bow up far enough into the wind to ensure there is no weight on the leech. The best indicator of this is that there is no weight

on the mainsheet at all. Turn switch to REEF, release halyard on winch retaining two turns around winch and depress button allowing the halyard to slip through hand with very little restriction. At desired reef point stop slightly above indicator mark on mast, cleat halyard and just touch foot button again which will give required tension. Should you wish to go up again remember to turn switch to EASE to release tension before going to HOIST. If you require to furl sail completely from any position of hoist it is best to pull main fairly well in and once again go up into the wind enough to remove weight from the leech (check mainsheet). Turn switch to REEF and with two turns around deck winch depress button and allow halyard almost unrestricted to run through hand stopping with head of sail approx. 300mm from feeder.

Points to Watch

1. Main Topper and Boom Vang must remain set when operating the system. If you require to adjust them while sailing this is not a problem, but they must be marked and reset before furling or unfurling commences. The correct setting is the topper just slightly eased and the boom vang pulled on tight against the topper when at full hoist and tensioned. (Slightly too much topper will only cause a problem in not being able to get the leech tight enough, but too little is a real problem in the respect that the sail will work forward, as it rolls, into the mast.
2. Always keep an eye on luff or sail when hoisting because should the deck winch not be turning for some reason and the mast motor is still unfurling, the sail could become so loose it could catch on the support bracket. While it is unlikely to damage anything at the worst situation, it could be necessary to take off the support bracket to clear the sail.
3. Should the deck motor ever fail the sail can be operated perfectly efficiently by taking the halyard onto a manual winch and hoisting while the mast motor unfurls the sail.
4. Should the mast motor fail, undo the two locating bolts and screws' to electric wiring and pull the motor off the mast. Insert winch handle and operate manually. If sail is reefed in strong winds to not attempt to remove mast motor without first putting a pair of vice-grips around the collar at the front end of the universal. Otherwise the drum may take off with the weight on it after you remove the mast motor. It may be easier here to just let the sail down in the conventional manner, place the winch handle in and rehoist the sail.

Lubrication

All bearings in the system are self-lubricating and apart from an annual check, should not require further attention. Once every second or third time out or if the system has not been used for a period of time it is desirable to give a squirt of silicone in the sheaves at the bottom of the mast at deck turning block and also the sliding rings the sail lasings are attached to at the tack and clew of the sail. Also remove the deck winch and give a squirt of grease in the grease nipple say once every two months as you would your anchor winch.

IMPORTANT

The motors selected to power this system are of a type commonly used on anchor winches and are extremely reliable and durable. However the gearing is such that while they have adequate power for the job the y do not have enough power to tear sails and damage other components, and will just stop if the foot button is continually depressed with the main halyard cleated or if something was jammed up. If the button is depressed and nothing happens it is most likely the motor is under maximum load

so look to see why and rectify the problem. While the mast motor does have a cut out, it could under some circumstances cause damage to the motor if the button as continually depressed with the motor under too much load to move. Also when sail is being furled if the motor stops it is because too much tens ion has been applied to the main halyard and cut out has been activated. Just leave it for 10 sec and try again. Also if you are demonstrating the system to people it is best not to pull the sail up and down more than three times in quick succession as firstly it will be hard on the batteries and secondly the motor could overheat.

ABOUT THE BOOM FURLER SYSTEM

Boomfurl consists of an outer open shell with a furling drum located inside around which the sail furls. Fully electric system consists of 2 electric motors, one located on the front of the mast which furls and unfurls the sail and second electric capstan which pulls the sail up via the main halyard and is located usually in the cockpit. The cockpit or deck motor can also be used for numerous other jobs such as mainsheet, headsail and general adjustments after sail is hoisted. When pulling the sail down or reefing only the mast motor operates and the halyard is lightly restricted via a couple of turns around the stationary deck winch and a minimal resistance applied by the hand as the halyard slips through. Boomfurl can also be supplied partially electric (mast motor only where sail is pulled up manually) or manual where the furling drum control leads back to a line drive winch on the deck and operates from the cockpit.

SIMPLICITY

The system is simple but robust and chances of mechanical failure are remote. However, even if such a problem does occur the system can be operated in the conventional manner as regards to hosting, reefing and lowering.

BATTERY PROBLEMS

The chance of a fully electric system totally failing because the batteries are low is very unlikely. When the sail is being hoisted both motors are operating so if the battery happened to be down a bit the first indication would be that the halyard winch motor was struggling to keep up with the speed the mast motor was unwinding the sail (all the load when hoisting is on the halyard winch motor). Even if because the batteries are a little flat the deck winch motor won't quite cope it is only a matter of switching to the tension mode and back a couple of times on the way up. If however the batteries were so flat that there just wasn't the power to pull the sail up, the system can be operated simply by pulling the sail up manually in conjunction with the mast motor unfurling the sail. Also for reefing or furling the sail only a minimal amount of power is required if the sail is tensioned (after the reefing point is established) manually. Should the mast motor fail it can be removed and refixed to the mast and a winch handle inserted for manual operation in about 30 seconds. If the mast motor should fail when the sail is reefed it is necessary to insert a pin supplied for the job into a hole in the front of the universal to lock the drum and ensure the sail doesn't unfurl with a rush after the mast motor has been removed. Alternatively the sail could be lowered the mast motor removed and winch handle inserted and the sail hoisted again either with the deck winch or manually.

BOOM POSITION AND MAIN SHEET

It is necessary during any operation of the system that the weight is removed from the leach of the sail i.e. from the mainsheet (always check that the mainsheet is slack before commencing operations). While operations can be successfully completed with the boom up to 30° out from the center line of the boat (if there is no weight on the mainsheet), generally the closer to the center line of the boat the boom is the neater the sail will furl. To pull the sail right down it is desirable to have the boom no further out than the corner of the tuck.

BOOM ANGLE

When operating the system it is essential that the vertical horizontal angle of the mast and boom is at a preset angle so if adjustments to boom vang and topping lift are required they must be reset before the system is operated. For general sailing it is probably better just to leave the topper in a fixed position and operate only the vang and just remembering to pull it tight against the topper before operating. A solid vang could be used but once again would have to be set to a fixed position before operating.

POSITIONING OF FITTINGS

Vang should be positioned as near as possible to drawings but mainsheet and other fittings can be positioned anywhere on boom.

WEIGHT

Is approximately 30% heavier than a conventional boom.

STRENGTH

Strength and durability is at least equal to a conventional boom.

MAINTENANCE

Apart from an annual check all that is required is a squirt of silicone spray on the sliding rings where tack and clew are attached and around feeder every month or so.

CONVERSIONS

Modifications are required to mast and sail and boom needs to be replaced. Unless sail is fairly new it is probably more practical to replace it.

OPERATIONS

When fully electric hoisting is fully automatic and when reefing or furling it is necessary to let the main halyard slip through the hand with a minimal amount of restriction.

ALTERNATIVE SET UP

For smaller yachts the system can be set up partially electric or totally manual. Partially electric would be with mast motor only and sail is pulled up and tensioned manually. This set up would be ideal for yachts in the 28 to 34' range or larger yachts with small mains.

RELIABILITY

Motors are of the type used as started motors on cars and anchor winches and are of proven reliability. Motors and switches are protected from the elements and in the unlikely event of a failure it would be only necessary to check the electrical connections as would be the case if a starter motor failed on a car.

EFFICIENCY FOR RACING

We consider and (has been proven so) that the efficiency of the mainsail is in no way effected by the system as regards to racing or cruising. The control over the main with the main halyard and vang only is at least equal to a conventional set up with main cunningham, leach Cunningham, outhaul and three reefining lines and all the hassles that go with them.

SAFETY

Because of the ease of handling and manual backups previously mentioned it brings a whole new concept to the safe and efficient handling of even very large yachts single handed.

OTHER ADVANTAGES

The ability to collect large quantities of fresh water makes it ideally suitable for cruising yachts. In even moderate rain with the main hoisted a large amount of fresh water will run down into the boom and can be collected by a hose from the outlet forward.

IMPORTANT POINTS TO WATCH WHEN HOISTING

It is important to keep an eye on the luff of the sail as it is being hoisted to ensure the halyard winch motor is coping with the speed the mast motor is unfurling (flat battery problem) because the sail becomes too loose on the drum it is possible it may catch on the support bracket as it is going up. If this does happen just pull the sail down again until it clears itself and then proceed with the hoist.

POWER OF ELECTRIC WINCHES

The winches have been geared in a manner where they have adequate power for the job but do not have the power to destruct anything (tear sails) if anything should go wrong. They will just stop.

PATENTS

Please note the boom furl system has been patented in New Zealand, Australia and Hong Kong.

Foot Switch, mode selection switch and boom motor:

Boom Motor

BOOMFURL OPERATIONAL AND FAULT FINDING GUIDE

Problem	Cause	Remedy
Nothing functions when foot button is depressed	Power not turned on	Check all switches
	Faulty connection on foot switch	Check terminals on foot switch
	Batteries are low	Turn to EASE and try. If mast motor operates, start boat motor and pull sail up manually.
	Batteries flat	Undo wing nuts on mast motor and remove insert winch handle. Pull sail up manually.
	Sail has been pulled down the wrong way in EASE mode instead of REEF mode	Switch to REEF and release a small portion of sail on the drum, then switch to TENSION and take up the slack. Repeat this procedure until sail is fully hoisted.
Only mast motor operates when foot switch is depressed	Batteries are low	Start boat motor & pull sail up manually
	Faulty connection on deck motor	Check terminals on deck motor and solenoid.
	Switch set in wrong mode	Check switch mode.
Only deck motor operates when foot switch is depressed	Switch set in wrong mode	Check switch mode.
	Faulty connection on mast motor	Check terminals on mast motor and solenoid
Deck motor doesn't cope with speed mast motor is unwinding	Batteries are low	Start motor and switch from HOIST to TENSION when required to take up slack.
	Sail is partially fulling	Push boat up into the wind and release mainsheet.
	Resistances on mast motor not correctly set	Change to higher resistance on resistance box.
	Resistance in turning block sheaves or main halyard	Check halyard is free and lubricate sheaves if necessary.
	NOTE: Regardless of the cause the sail may be hoisted satisfactorily by just switching to TENSION and back to HOIST when necessary.	
Sail hoist is very slow and seems to be under too much load	Tension has not been released by turning to EASE mode briefly before hoisting commences	Switch to EASE mode and back to HOIST
	Resistance on mast motor set incorrectly	Change to higher resistance on resistance box.
Sail gets caught at support bracket when hoisting	Sail has been allowed to become extremely loose when hoisting. This can only occur through careless operation.	Turn switch to REEF mode and furl sail until it is clear of bracket. In a extreme situation it could be necessary to remove support bracket to free sail.
Deck motor will not function after hoisting	Motor under maximum load.	

Mast motor will not function to pull sail down after hoisting	Motor under maximum load.	Check main halyard cleat has been fully released.
Mast motor seems to be straining to pull sail down	Switch on EASE mode instead of REEF and pulling sail down the wrong way.	Rehoist sail by switching between TENSION and REEF and pull down right way.
	Too much resistance on main halyard.	Take turn off winch drum or allow halyard to slip through hand more freely.
Mast motor cuts out when lowering	Too much resistance and overload has cut in.	Wait 10 seconds and try again.
Sail works forward as sail is lowered and battens push hard into teflon pad on mast	Sail has been made incorrectly	Have sail recut on foot to decrease tack angle.
	Sail is partially fulling	Turn boat head to wind or ease mainsheet further.
	Topping lift has been released and not reset before furling commences.	Pull topper onto present position and pull boom vang tight against it to hold correct angle.
	NOTE: If sail has worked forward and you wish to continue furling remove all the weight from the main halyard and furl very loosely.	
Sail works back and pulls hard against feeder.	Sail fault.	Have foot of sail recut and tack angle increased.

DON'T:

- Try to pull sail up or down when sail is fulling AT ALL. While the system will still operate it causes excessive load on motors and excessive wear on the sail with possible sail damage. Sail can be reefed to 1, 2 or 3 reef position with the boom up to 30^0 out from center line providing the leach is under no load AT ALL. Check no weight is on the mainsheet.
- Keep pushing foot button if the system doesn't work, chances are motors are under maximum load. Check out where the problem lies and rectify it.
- Try and fully hoist or furl the sail with the boom more than 20^0 off center line. Ensure the sail is not fulling at any time during operation.
- Keep hoisting the sail when it becomes extremely loose on the drum. Just flick to TENSION and back to hoist when necessary.
- Operate system when boom angle has not been set correctly with topper and vang.

Component	Quantity	Manufacturer	Model	Description
Boom Motor	1	Magneti Marelli	Type M78R(1.4)	Date: 40-88 26801H 12V
Contactor	5			

Rodkicker	1	Selden	Type 30	Gas Spring Selden 308-073-04 (Aratron AB G40-300-5000N-02 with 300mm stroke, 10M threads on both ends, 800mm extended length).

TV / SOUND SYSTEM

The inverter must be on for TV and sound system to work and the TV switch on the AC control panel also ON. Don't forget to also turn on the aerial switch inside the door where the TV is mounted.

MICROWAVE

Turn on inverter and then turn on KITCHEN circuit breaker on AC control panel.

DINGHY

Component	Quantity	Manufacturer	Model	Description
Dinghy	1	Apus	290	2.90m Apus Aluminum RIB
Outboard Engine	1	Yamaha	Enduro 15	Two cylinder, two cycle outboard motor

HULL ANODES

All under water hull anodes may be changed underwater though it is very easy to drop the anode or bolt(s).

Component	Quantity	Manufacturer	Model	Description
Prop Shaft Anode	1 or 2		1-1/2"	
Rudder Anode	1			Teardrop shape with two hole spacing of 1-1/4"
Ground Anode	1			Rectangular, two bolt spacing 3-1/2", 10mm bolt
Prop Shaft Support Anode	2			
Engine Intake Anode	1			2-3/4" hole spacing, 5" x 1-3/4" rectangle

SPARES

This list is just a place holder for useful onboard spares information. It is by no means complete.

Component	Quantity	Manufacturer	Model	Description
12V Water Pump	2	Flojet	4405-143	Potable Water Pump. One labeled "Needs Service" 14/11/09. 7.0A max. 3.3gpm max. 35psi cutoff. Thermally protected.
12V Water Pump	2	Jabsco	PAR-MAX3 Model: 30600-0212	Low pressure 3.4gpm automatic water pressure pump. 4.4A at 10psi. 5A fuse/breaker required.
Panda Generator Electric Fuel Pump	1	ecco	1LM12V	12V electric fuel pump. NOT original fischer panda part. Original fischer panda fuel pump is a HARDI 14412.